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Updated list of the larger mammals of the Comoé National Park, Ivory Coast

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Summary. – In this study we present an updated list of the larger mammals of the Comoé National Park in the Republic of Ivory Coast (West Africa). We did not include in our investigations the northernmost, drier part of the park. Using direct observations as well as reliable indirect signs we proved the existence of 69 species of larger mammals. Chiroptera as well as Insectivora and the smaller Rodentia have been excluded from our surveys. If those orders and the drier parts of the park are surveyed more intensively during future studies the recorded number of mammal species found in the area will rise. As a result of our study the total number of mammals found in the Comoé National Park arose to 152 species including Chiroptera, Insectivora and Rodentia, 11 of which are new to the park. Five of the former present species have not been observed during the last decade and therefore might be extinct.

Résumé. – Au cours de cette étude, nous présentons une liste remise à jour des grands mammifères du Parc national de la Comoé en Côte d'Ivoire. La partie nord du Parc, la plus sèche, n'est pas prise en compte dans cette étude. D'après nos observations 69 espèces de grands mammifères vivent dans le Parc, ce qui porte à 152 le nombre des espèces de mammifères qui en sont connues, y compris les petits mammifères dont 11 nouvelles espèces y ont été recensées (mais 5 d'entre elles n'ont plus été observées au cours de la dernière décennie).

KEY WORDS : Comoe National Park, larger mammmals, list, Ivory Coast.

INTRODUCTION

Covering 11 500 km², almost 4 % of Ivory Coast's land surface, the « Parc national de la Comoé » (PNC) is West Africa's largest national park. It is located in the northernmost part of the country between 9°6'N – 8°5'N and 3°1'W – 4°4'W (Fig. 1). Established in 1926 as the « Refuge nord de la Côte d'Ivoire » it was enlarged in 1953 and renamed as « Reserve de Faune de Bouna ». Since 1968 this wildlife reserve has been a National Park and later was declared a Biosphere Reserve. In recognition of its unique flora and fauna, the park was inscribed upon the UNESCO World Heritage List in 1983.

Due to the mosaic of open grasslands, bush and tree savanna of various density, forest islands, inselbergs and the gallery forest the park offers diverse habitats.

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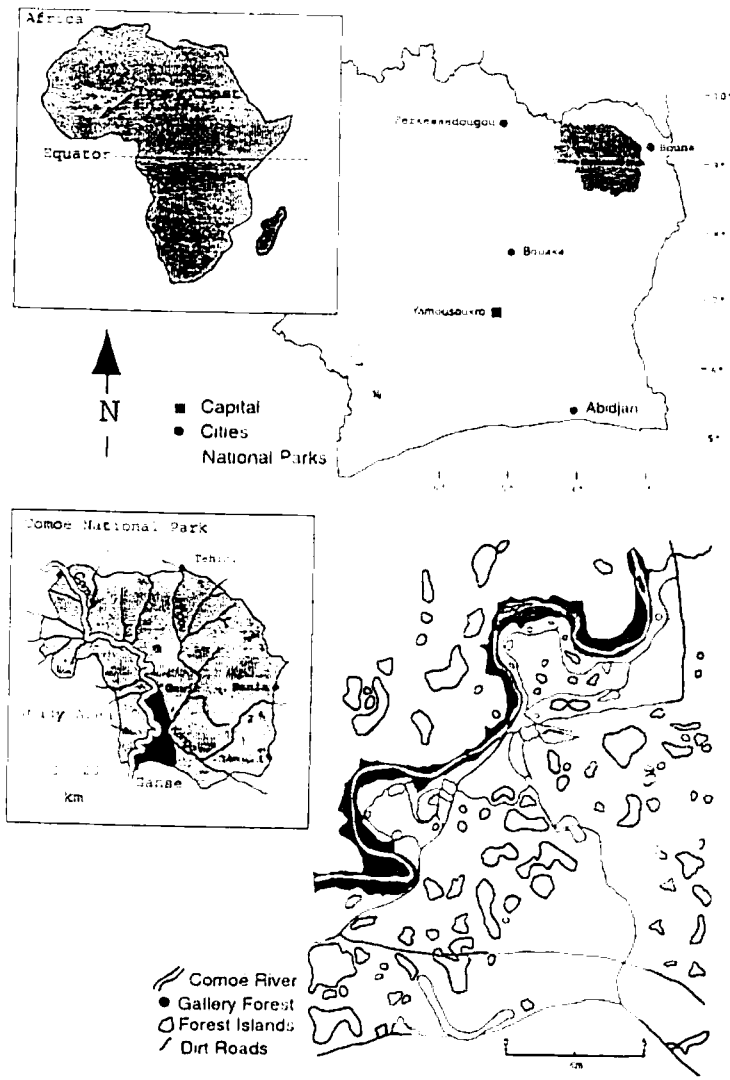

Fig. 1. – Parc national de la Comoe

In 1968 and 1969 an investigation of the mammal fauna of the Comoe was undertaken by Geerling and Bokdam (1973) who identified 30 species of larger mammals. In the late seventies a study on the status of the PNC was conducted in order to evaluate its potential for tourism (Gesellschaft für technische Zusammenarbeit GTZ 1979). During that study all species of larger mammals as well as birds and reptiles encountered were identified at the species level. Although small mammals such as Rodentia, Insectivora and Chiroptera were excluded from their investigation, the authors detected 57 mammal species. Three additional species (*Lycaon pictus*, *Hyemoschus aquaticus* and *Neotragus pygmaeus*) are listed as «doubtful» in the GTZ report. Another study using data collected in the 1980s listed 62 species of larger mammals (Poilecot 1991). Later studies by Fahr (1997, pers. comm.), who found 55 species of Chiroptera, and Mess and Krell (1999), who identified 30 species of rodents and insectivores in the park (including *Protoxerus stangeri* that has not been observed by the other studies), provided important information on the park's fauna.

At the end of the 1980s almost all management activities in the PNC ceased, poaching increased and today is ubiquitous (Fischer 1996; Fischer and Linsenmair *in press*). This probably has already led to the extinction of some species and heavily threatens others. Illegal plantations within the park's boundaries as well as poisoning of streams and ponds for fishing are additional threats to the PNC.

The aim of our study was to present an updated list of all larger mammals still living in the PNC and to compare these findings with results of earlier studies in the same area.

MATERIAL AND METHODS

Study site

Data have been collected in the southern part of the park in the vicinity of the research station of the University of Wurzburg. Due to the poor infrastructure in the northeast it was not possible to collect data in this region. The main study area surveyed covered about 80 km² and contained all vegetation types mentioned above.

The habitat is referred to as a bush/tree savanna of the Sudan/Guinea type with tree densities of 0.2 - 10 per 100 m². Among the most common trees are *Terminalia macroptera*, *Afzelia africana*, *Nauclea latifolia*, *Vitellaria paradoxa*, *Detarium microcarpum* and *Daniellia oliveri*. The grass stratum is dominated by species of the genera *Hyparrhenia*, *Panicum*, *Andropogon*, *Schizachyrium*, *Pennisetum*, *Ctenium* and *Loudetia*. Scattered into the savanna are forest islands of various size (0.5 ha - several km²) which are believed to be remnants of closed dry forests (Poilecot 1995). The Comoe river is bordered by a gallery forest which reaches up to 200 m in width in the southern part of the park. It is smaller or even entirely absent in the north of the park. The gallery forest is dominated by *Cynometra megalophylla*, but *Lannea acida* is also found in substantial numbers. The most prominent as well as the tallest tree is *Ceiba pentandra* which is also very common. The vegetation of the gallery forests resembles that of the West African rain forests and has been described in detail by Porembski (1991) and Poilecot (1991).

Spatial and temporal patterns of rainfall in the park are highly variable. During the wet season from March till October about 90 % of the annual rainfall occurs. Total annual precipitation in the southern part ranged from 856 - 1 248 mm during the study period (1993-2000).

Data collection

All observations of mammals as well as their tracks, traces (feces, nests, remnants of prey, etc.) and vocalizations were noted between March 1993 and May 2000. The observations were made in all habitats in the southern part of the park but focused on the savanna. We also include here those observations in the study area that have been made between 1992 and 1998 by other reliable observers (experienced biologists) from the research camp of the University of Würzburg and the tourist guides of the villages of Kakpin and Gansé. Records of the author's observations were kept in written form by one of us (F.F.). In 1998 all researches who worked at the station between 1992 and 1998 were asked about their mammal observations. Since most of them did not keep detailed records in most cases it is not possible to give the exact date observations were made. However, all questioned people were able to give the month and year as well as habitat descriptions in which certain mammals have been observed. Reported sightings were only included if the observer could describe the appearance and behavior including the social structure of the species in a manner that made confusion with other species extremely unlikely. In addition tourist guides were asked to look for known species in « African Mammals » (Kingdon 1997) and were also asked if they ever observed species that are restricted to South and East-Africa. They never claimed to have seen an animal that definitely does not occur in West-Africa. Tracks were identified following Walker (1996).

Observers and locations are listed in parenthesis for all species that have been observed less than 10 times.

Taxonomy follows Haltenorth and Diller (1977) and Wilson and Reeder (1993) for primates, and Kingdon (1997) and Wilson and Reeder (1993) for all other orders.

RESULTS

We discovered 69 larger mammal species during our work in the park (Table 1). Seven of these were observed only once, two we could only identify from tracks, one was only found as remnants in leopard scats and two were only described by the tourist guides of Kakpin and Gansé.

Some species found by previous authors were not found by us nor reported to us. We were not able to prove the existence of *Lycaon pictus* found by Poilecot (1991) and reported to Geerling and Bokdam (1973). Aeschlimann (1965) mentioned that the species occurred in the northern parts of the Ivory Coast. *Felis sylvestris libyca* listed in the GTZ survey (1979) was not found by us.

In the ungulate group we did not find any traces of the bongo *(Tragelaphus euryceros)* and the bohor reedbuck *(Redunca redunca)* both of which have been observed by Geerling and Bokdam (1973), the GTZ team (1979), and Poilecot (1991). Aeschlimann (1964) does report the reedbuck to occur in the Ivory Coast as well as the sitatunga *(Tragelaphus spekei)*. Unfortunately no exact locations are given for either species by Aeschlimann. To Geerling and Bokdam (1973) a sighting of a sitatunga west of the PNC was reported. According to Roth and Hoppe-Dominik (1990) on the other hand there is little evidence that the sitatunga ever occurred in the Ivory Coast. We did not observe *Heliosciurus gambianus* wich had been documented for the park by Poilecot (1991) and the GTZ team (1979). The species can probably be still found in the park and has only been missed due to its habitat preference.

TABLE 1. ' = incomplete survey; * = encountered once; ** = several times; *** = regularly; ... = in leopard faeces; – = *Galagoides demidovi* or *G. thomasi*; # = subspecies according to Haltenorth and Diller (1977), but following Kingdon (1997) probably hybrid of *C. potskamos* *pollmani* with *C. celerosus*; numbers in parenthesis give the exact number of observations for those species observed more than once but less than 10 times.
GB = recorded by Geerling and Bokdam; GTZ = recorded by GTZ/FGU; P = recorded by Poilecot.
Mungos mungo and *Felis serval* = reported by tourist guides only.

	Seen	Heard	Tracks	GB	GTZ	P
PRIMATES						
Pan troglodytes verus	** (2)	***	**		✓	✓
Colobus (Procolobus) verus	** (3)					
Colobus vellerosus	***	***		✓	✓	✓
Papio anubis	***	***	***	✓	✓	✓
Cercocebus torquatus lunulatus	***	**			✓	✓
Erythrocebus (Cercopithecus) patas	**			✓	✓	✓
Cercopithecus aethiops sabaeus	**			✓	✓	✓
Cercopithecus campbelli lowei	**				✓	✓
Cercopithecus nictitans martini	** (2)				✓	✓
Cercopithecus petaurista petaurista	**	***		✓	✓	✓
Cercopithecus diana roloway	** (2)				✓	✓
Perodicticus potto potto	*					
Galago senegalensis	***				✓	✓
Galagoides demidovi	** (2)					✓
INSECTIVORA'						
Atelerix albiventris	** (2)					
LAGOMORPHA						
Lepus saxatilis	***				✓	✓
RODENTIA'						
Euxerus erythropus	***				✓	✓
Protoxerus stangeri	*					
Funisciurus pyrrhopus	**					
Paraxerus poensis	**					
Heliosciurus gambianus					✓	✓
Heliosciurus rufobrachium	**					
Anomalurus derbianus	*					
Hystrix cristata	**		**		✓	✓
Atherurus africanus			**			
Thryonomys swinderianus	**		**		✓	✓
Cricetomys gambianus	**					✓
PHOLIDOTA						
Smutsia gigantea	*				✓	✓
Phataginus tricuspis	** (5)				✓	✓
TUBULIDENTATA						
Orycteropus afer	**		***	✓	✓	✓
HYRACOIDA						
Procavia ruficeps	*				✓	✓
Dendrohyrax dorsalis	*	**			✓	✓

	Seen	Heard	Tracks	GB	GTZ	P
PROBOSCIDEA						
Loxodonta africana cyclotis	** (3)			✓	✓	✓
ARTIODACTYLA						
Hippopotamus amphibius	***	***	***	✓	✓	✓
Hylochoerus meinertzhageni	* (2)				✓	✓
Potamochoerus porcus					✓	✓
Phacochoerus africanus	***	**		✓	✓	✓
Hyaemoschus aquaticus						
Syncerus caffer	***	**	***	✓	✓	✓
Tragelaphus scriptus	***			✓	✓	✓
Tragelaphus eurycceros					✓	✓
Neotragus pygmeus			** (2)			
Sylvicapra grimmia	**			✓	✓	✓
Cephalophus rufilatus	***			✓	✓	✓
Cephalophus niger	**			✓	✓	✓
Cephalophus sylvicultor	** (4)		**	✓	✓	✓
Cephalophus dorsalis	**			✓	✓	✓
Ourebia ourebi	***			✓	✓	✓
Redunca redunca				✓	✓	✓
Kobus kob kob	***	***	***	✓	✓	✓
Kobus ellipsiprymnus	***		**	✓	✓	✓
Alcelaphus buselaphus major	***		***	✓	✓	✓
Hippotragus equinus	**			✓	✓	✓
CARNIVORA						
Mellivora capensis	** (3)			✓	✓	✓
Lutra maculicollis			**			
Aonyx capensis			**			
Herpestes ichneumon	** (2)				✓	✓
Herpestes sanguinea	**				✓	✓
Mungos gambianus	** (2)				✓	✓
Mungos mungo					✓	✓
Crossarchus obscurus	**				✓	✓
Atilax paludinosus	***				✓	✓
Ichneumia albicauda	**				✓	✓
Crocuta crocuta	**	***	***	✓	✓	✓
Lycaon pictus						✓
Canis adustus	**					✓
Nandinia binotata	** (3)					
Genetta sp. (pardina)	***	**	***		✓	✓
Civettictis civetta	** (3)			✓	✓	✓
Felis sylvestris libyca					✓	✓
Felis serval	(1)			✓	✓	✓
Felis aurata	** (2)			✓	✓	✓
Panthera pardus	**	***	***	✓	✓	✓
Panthera leo	** (3)	**	**	✓	✓	✓

We record for the first time *Nandinia binotata*, *Aonyx capensis*, *Lutra maculicollis*, *Colobus verus*, *Atelerix albiventris*, *Funisciurus pyrrhopus*, *Heliosciurus rufobrachium*, *Paraxerus poensis*, *Anomalurus derbianus*, and *Atherurus africanus*. Reliable observation of the tracks of *Neotragus pygmaeus* have been made.

A first sighting of a group of *Pan troglodytes* was made in November 1998 in the gallery forest of the west bank of the Comoé river (Fischer and Gross 1999). F.F. observed on adult male in May 2000 in the savanna east of the Comoé river entering the gallery forest. One sighting of *Perodicticus potto* from the gallery forest of the Comoé river in the south of the park was reported to us (M. Boutros, August 1997). *Cercopithecus diana roloway* has not been observed after 1993. In that year two sightings of this species have been made in March and April in the gallery forest of the Iringou and Comoé rivers (P. Yao). Th. Hovestadt observed a group of Diana monkeys in 1990 in the gallery forest of the Iringou river. We observed *Colobus verus* three times at the border of the Comoé river. In all but one case between two and four of these monkeys were associated with *Cercopithecus petaurista petaurista*. They were feeding close to each other at the west bank of the river in heights of 2-4 m above ground. All observations were made in April 1999 when at least one colobus female carried an infant that was allowed to stroll around within a couple of meters away from its mother. One observation of a mixed group of green colobus, lesser spot-nosed monkeys and *Cercopithecus campbelli lowei* has been made in July 1999. All animals fed close to each other in heigths of 2-10 m. *Cercocebus torquatus lunulatus* groups of up to 23 animals (including 6 infants in May 1998) have been encountered. Their calls are heard frequently at the beginning of the rainy season (March-May). A group of five as well as one of three *C. nictitans martini* have been observed in the gallery forest of the Iringou river in September 1992 (P. Yao). No further information could be given here.

The only flying squirrel observed in a hollow tree in an island forest during the day was *Anomalurus derbianus* (J. Fahr, November 1999). *Thryonomys swinderianus* has been observed alone or in groups of up to five animals in the dense savanna in stands of high and often dry grass. Their remnants were frequent in leopard scats. All three observations of honey badgers were made by us in the savanna, close to water holes in the rainy season of 1993. All were black and white individuals. The tracks of *Lutra maculicollis* and *Aonyx capensis* have been observed in the mud of the Comoé river border close to hippo pathways in the gallery forest. A group of *Crossarchus obscurus* regularly visits the research camp. The animals can be observed from short distances making confusion with *Mungos gambianus*, from which one dead animal has been found in the savanna and groups have been encountered in dense savanna formation, unlikely *Mungos mungo* have been observed by tourist guides several times in the north of the park. No exact dates of observation could be given, but several guides claimed to have seen them independently of each other. *Nandinia binotata* has been observed in the gallery forest of the Iringou river as well as in one forest island close to the village of Kalpin (J. Fahr, November 1998, F.F., M.G., February 2000). In February 2000 one *N. binotata* was observed during 3 successive night on a flowering *Parkia biglobosa* tree, probably hunting approaching fruit bats that were feeding here. *Civettictis civetta* was observed two times by tourist guides at night and one time in March 1997 during the day while sleeping in a termite mound in the savanna at the west bank of the Comoé river. *Felis aurata* has been observed two times in 1992 and 1993 respectively by M.O. Roedel at night at the Ganse water hole 18 km north of the village of Ganse close to the Comoé river. Lions have been observed three times in the savanna close to the research camp either alone (2 x) or as a pair (1 x). All males observed as well as all sightings reported to us from before our study period had only short and fuzzy manes.

The giant pangolin has been found by us at the edge of the gallery forest of the Comoe river in May 1996 at night. Tracks have been found once at a water hole in the gallery forest of the Comoé river. *Phataginus tricuspis* has been observed in the gallery forest by J. Korb and tourist guides on several occasions between 1993 and 1998. *Procavia ruficeps* has been observed by S. Doerrstock in November 1993 on one of the inselbergs (rock outcrops) in the savanna close to the Iringou river, and one tree hyrax *Dendrohyrax arboreus* (with a white back) was seen on a termite mound at the gallery forest edge in the savanna in April 1994.

Potamochoerus porcus (alone or in pairs) have been observed several times by tourist guides in the gallery forest of the Comoe river but no exact data of observation could be given. Last observations however have been made at least 5 years ago. *Hylochoerus meinertzhageni* have been observed by M.G. who saw one individual wallowing in a mud hole in July 1993 in one of the forest islands in the south of the park. An additional observations was made by K.E.L. who took pictures of a group of giant forest hogs prior to the period include in this study. Tourist guides observed six animals in June 1997 in the gallery forest of the Comoe river close to the village of Gorowi. In two cases tracks of the royal antelope *Neotragus pygmaeus* were shown to F.F. by experienced former hunters who are now working as tourist guides. We believe that the knowledge of these observers is sufficient to make this record a reliable one. *Cephalophus sylvicultor* was observed by F.F. and M.G. respectively in the savanna entering the gallery forest of the Comoe river in May 1994 and April 2000. Tracks have been found frequently by experienced tourist guides and F.F.

DISCUSSION

Number of species found and expected

Our survey focused on the savanna ecosystem in the southern (= wetter) part of the park and has been completed only by relatively few observations in the gallery forest and forest pockets. The real number of the large mammal species might be higher than our survey results suggest. In particular our list of the forest dwelling species is most probably far from being complete due to the small body size, elusive habits and shyness of those animals. Rodents, insectivores and bats need further intensive investigations as does the drier north of the park.

Sightings of *Colobus vellerosus* became rare after 1997 both species are probably declining and *Cercopithecus diana roloway* might even be extinct. *Colobus verus* was not observed by other investigators and hence is new on the park's list. There is a slight chance that *Colobus badius waldroni* is also present in the PNC. The red colobus was never observed but it is possible that remnants of this species were present in leopard scats. One of us (M.G.) once found hairs in a leopard scat that resembled the red colobus hair structure described by Bodendorfer (1995). These hairs are supposed to be compared with red colobus hair from museum specimens to check if they belong to that species.

The PNC is one of the last refuges for *Cercocebus torquatus lunulatus* in the Ivory Coast that is nearing extinction in other parts of the country McGraw (1998). The fact that members of this species can be frequently encountered in the PNC in the savanna as well as the forest islands and the gallery forest and underlines the importance of the PNC for the conservation of primates in the country.

Anomalurus beecrofti as well as *Anomalurus peli* are both listed for the Marahoué National Park (Bousquet 1992) and they might also occur in the PNC. *Idiurus macrotis* has already been documented from the Ivory Coast and might also be found in our study area since suitable habitat (Julliot *et al.* 1998) is available.

Since the northern part of the park contains more open vegetation, smaller gallery forest, almost no forest pockets and receives less precipitation, some of the species preferring drier habitat might occur still and only there. The Haussa genet (*Genetta thierryi*) should roam the studied area according to Kingdon (1997) and Rosevear (1974), althought its occurrence was cited doubtful for the PNC by Hoppe-Dominik (1990). *Genetta genetta* may occur in the savanna. We observed genets there frequently but we were not able to determine them on the species level. Whereas most of them were probably *Genetta sp. (pardina)* it can not be ruled out that some individuals have been Haussa genets. Due to the dense gallery forest and large forest patches the PNC might also host a population of the west African linsang *Poiana leightoni*. Bousquet (1992) mentions that six species of genets are known from the PNC but neither gives species names nor the source for this information. In the family Felidae *Felis sylvestris libyca* might occur in the north of the PNC where it has been reported by Poilecot (1991) and GTZ (1979). In neither of these publications is any further information about the wildcat observations given. The mustelid *Ictonyx striatus* occurs in the Ivory Coast according to Happold (1973) but no literature or material evidence is given for that assumption.

There is a slight chance that *Felis caracal* can be found in the northernmost parts of the park.

Extinction of species

For the forest dwellers it is very plausible that species have been missed. With the exception of the small mammal orders mentioned above, this is less likely for the taxa preferring the savanna habitat. Provided that this assumption is true we fear that the bohor reedbuck (*Redunca redunca*) has gone extinct. There could be slight chance that it still occurs in the northernmost, drier part of the park in very small numbers, but no sighting from there was reported to us. The second species for which extinction is most likely is *Lycaon pictus*. Wild dogs have been observed by different people in the park as late as 1993 but not thereafter. Their existence of this conspicuous species in other parts of the park is not very likely. However all former sightings have been made in the northern, drier part of the park. Here *Canis adustus* can still be found frequently which has never been observed by us south of Gawi. If wild dogs are still present they probably will be only found in the north of the park.

If the bongo (*Tragelaphus eurycerus*) has gone extinct or has not been encountered due to its elusive habits can not be determined with certainty. Since bongo habitat can only be found to a larger extent in the southern part of the park surveyed by us and no signs of this species have been found there, its extinction is possible. However, bongo sightings have been reported to us from outside the park west of the Comoé river. We do not know how reliable such observations are and do not include them here.

The small bovid *Hyaemoschus aquaticus* has been reported for the PNC to the GTZ team by local people. It has never been observed by any scientist in that region but Bourliere *et al.* (1974) listed it for the region of Lamto approximately 300 km south of the PNC and Bousquet (1992) put them on his Marahoué list. Since other spe-

cies preferring dense habitat do also occur in the PNC we cannot rule out that this is also the case for *Hyaemoschus aquaticus*.

According to Kingdon (1997) the PNC includes the former range of the giraffe *(Giraffa camelopardalis)*, the black rhino *(Diceros bicornis)* and Derby's eland *(Taurotragus derbianus)*.

Sidney (1965) mentions reports of hunters who shot one or two rhinos in 1905 near Bouna close to the eastern border of the park. According to a villager in Kakpin the last rhino in the park had been shot at least 40 years ago. There are no literature or material proof that the giraffe and Derby's eland ever occurred in the park.

We did not find any signs of cheetah *(Acinonyx jubatus)* nor was a sighting of one reported to us. Some villagers recalled that they had heard of the shooting of one of these cats a long time ago but could not give an exact date. A French resident of Kakpin claimed to have seen a cheetah more than 20 years ago. The extinction of this felid is certain and might date back to the 60s or 70s. There were two sightings of a zebra duiker *(Cephalophus zebra)* reported to us. A Belgian hotel manager from Kafolo and a guard of the park independently of each other claimed to have observed this ungulate about 10 to 15 years ago. Since the zebra duiker is a very conspicuous animal and one observation referred to a dead specimen we do not believe that the two observers had mistaken it for any other species. Since both sightings were made a long time ago we did not include them in our list. The Ivory Coast lies within the range of the Ogilby's duiker *(Cephalophus ogilbyi)* but neither was a sighting of this species made by us nor reported to us.

In conclusion we would like to emphasize the richness of the mammal fauna found in the PNC. With the 69 species of larger mammals recorded by us and a total of 75 species found so far its compares to other major protected sites in Africa. For example do Sinclair and Arcese (1995) give a total of only 69 large mammal species for the comprehensively studied Serengeti ecosystem. The species diversity of the PNC is probably unique to West-Africa and certainly to the Ivory Coast.

All large cats as well as elephants and most of the larger ungulates are very rare in the Ivory Coast. The park is the last refuge for some species extinct in all other parts of the country including the other National Parks. Due to overhunting and a lack of management the park and its fauna are heavily threatened. This has probably already led to the extinction of certain species and others are about to follow. Since a management project for the PNC started, we hope that this development can be stopped soon. In order to complete our list of mammals future research on the mammalian fauna should include intensive sampling of the northern area and focus on the orders Insectivora, Rodentia and Chiroptera.

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Cranio-sensory adaptations in small faunivorous semiaquatic mammals, with special reference to olfaction and the trigeminal system

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Summary – The independent evolutionary invasion of an aquatic environment in different groups of mammals has resulted in convergent specializations in sensory systems of the head. Such systems consist of soft tissue structures associated with measurable bony features. We quantitatively examined skulls of a wide range of small semiaquatic mammals (Didelphidae, Soricidae, Talpidae, Tenrecidae, and Muridae), and their phylogenetically close terrestrial counterparts to test for differences in the development of the trigeminal system and of olfactory structures. We measured the size of the foramen magnum, infraorbital foramen, the width of the anterior cranial fossa, and assessed the presence or absence of basicranial fenestrae and lacrimal foramina. Histological preparations were examined for a subset of these taxa. Most of the semiaquatic sample has smaller anterior cranial fossae, larger infraorbital foramina and nerves, and larger foramina magna. We interpret these results as generally consistent with the observation that semiaquatic mammals have a well-developed trigeminal system and underdeveloped olfactory system relative to terrestrial taxa. However, there are exceptions to this trend, explanations for which must be examined on a case by case basis. Only semiaquatic tenrecs consistently show basicranial fenestrae and absent lacrimal foramina. The size of the vomeronasal organ in the Tenrecidae is not affected by semiaquatic habits.

Résumé – L'invasion du milieu aquatique par deux groupes différents de mammifères, indépendante au cours de l'évolution, a pour résultat des spécialisations convergentes dans le domaine des systèmes sensoriels de la tête. De tels systèmes sont composés de structures de tissus mous associés avec des éléments osseux mesurables. On a examiné quantitativement les crânes d'un grand nombre de petits mammifères semi-aquatiques et de leurs proches parents de vie terrestre afin de chercher des différences dans le développement de leur système trigéminal et de leurs structures olfactives. On a mesuré les dimensions du foramen magnum, du foramen infraorbitaire, et la largeur de la fosse crâniale antérieure, et on a mis en évidence la présence ou l'absence des fenêtres basicrâniales et des foramens lacrymaux. On a examiné des préparations histologiques pour une partie des taxa. La plupart des spécimens semiaquatiques ont une fosse crâniale antérieure plus petite, des foramens infraorbitaux plus grands et des nerfs plus gros, et un foramen magnum plus grand. Ces résultats sont pour la plupart concordants avec l'observation que les mammifères semi-aquatiques ont un système trigéminal bien développé et un système

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